

IN THE CLAIMS:

Please cancel claims 1-46 without prejudice or disclaimer, and substitute new claims 47-107 therefor as follows:

Claims 1-46 (Cancelled).

47. (New) A crosslinkable elastomeric composition comprising:
at least one vulcanized rubber in a subdivided form surface treated with at least one silane coupling agent;

at least one diene elastomeric polymer; and

at least one sulfur-based vulcanizing agent.

48. (New) The crosslinkable elastomeric composition according to claim 47,
wherein the vulcanized rubber in a subdivided form has a particle size not higher than 5 mm.

49. (New) The crosslinkable elastomeric composition according to claim 47,
wherein the vulcanized rubber in a subdivided form has a particle size not higher than 1 mm.

50. (New) The crosslinkable elastomeric composition according to claim 49,
wherein the vulcanized rubber in a subdivided form has a particle size not higher than 0.5 mm.

51. (New) The crosslinkable elastomeric composition according to claim 47,
wherein the vulcanized rubber in a subdivided form is present in an amount of 2 phr to 90 phr.

52. (New) The crosslinkable elastomeric composition according to claim 51, wherein the vulcanized rubber in a subdivided form is present in an amount of 5 phr to 30 phr.

53. (New) The crosslinkable elastomeric composition according to claim 47, wherein the vulcanized rubber in a subdivided form comprises at least one crosslinked diene elastomeric polymer or copolymer selected from: cis-1,4-polyisoprene, 3,4-polyisoprene, polybutadiene, optionally halogenated isoprene/isobutene copolymers, 1,3-butadiene/acrylonitrile copolymers, styrene/1,3-butadiene copolymers, styrene/isoprene/1,3-butadiene copolymers, styrene/1,3-butadiene/acrylonitrile copolymers, or mixtures thereof.

54. (New) The crosslinkable elastomeric composition according to claim 47, wherein the vulcanized rubber in a subdivided form comprises at least one crosslinked elastomeric polymer of one or more monoolefins with an olefinic comonomer or derivatives thereof.

55. (New) The crosslinkable elastomeric composition according to claim 54, wherein the crosslinked elastomeric polymer is selected from: ethylene/propylene copolymers ethylene/propylene/diene copolymers, polyisobutene, butyl rubbers, halobutyl rubbers, chlorobutyl or bromobutyl rubbers or mixtures thereof.

56. (New) The crosslinkable elastomeric composition according to claim 47, wherein the diene elastomeric polymer is selected from: cis-1,4-polyisoprene, 3,4-polyisoprene, polybutadiene, optionally halogenated isoprene/isobutene copolymers, 1,3-butadiene/acrylonitrile copolymers, styrene/1,3-butadiene copolymers,

styrene/isoprene/1,3-butadiene copolymers, styrene/1,3-butadiene/acrylonitrile copolymers, or mixtures thereof.

57. (New) The crosslinkable composition according to claim 47, wherein the elastomeric composition comprises at least one elastomeric polymer of one or more monoolefins with an olefinic comonomer or derivatives thereof.

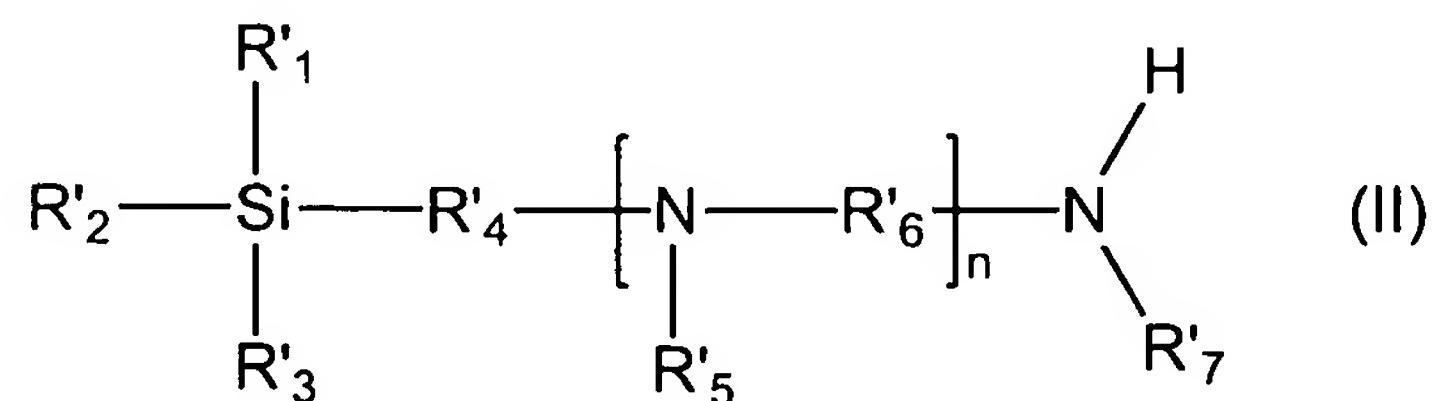
58. (New) The crosslinkable elastomeric composition according to claim 57, wherein the elastomeric polymer is selected from: ethylene/propylene copolymers, ethylene/propylene/diene copolymers, polyisobutene, butyl rubbers, halobutyl rubbers or mixtures thereof.

59. (New) The crosslinkable elastomeric composition according to claim 47, wherein the silane coupling agent is selected from sulfide silane compounds having the following formula (I):



wherein Z is selected from the following groups: $-\text{Si}(\text{R}_1)_2(\text{R}_2)$, $-\text{Si}(\text{R}_1)(\text{R}_2)_2$ and $-\text{Si}(\text{R}_2)_3$, in which R_1 is a $\text{C}_1\text{-C}_4$ alkyl group, a cyclohexyl group or a phenyl group and R_2 is a $\text{C}_1\text{-C}_{18}$ alkoxy group or a $\text{C}_5\text{-C}_8$ cycloalkoxy group; Alk is a divalent hydrocarbon containing from 1 to 18 carbon atoms and n is a number from 2 to 8.

60. (New) The crosslinkable elastomeric composition according to claim 47, wherein the silane coupling agent is selected from aminosilane compounds having the following formula (II):



wherein:

R'₁, R'₂ and R'₃, which may be identical or different, are selected from hydrogen, C₁-C₈ alkoxy groups, C₁-C₁₈ alkyl groups, C₆-C₂₀ aryl groups, C₇-C₃₀ alkylaryl or arylalkyl groups, on condition that at least one of the groups R'₁, R'₂ and R'₃ represents an alkoxy group;

R'₄ is selected from C₁-C₈ alkylene groups, C₆-C₂₀ arylene groups, said arylene groups optionally being substituted with C₁-C₈ alkyl groups;

R'₅ and R'₇, which may be identical or different, are selected from hydrogen, C₁-C₁₈ alkyl groups; or, when R₅ and R₇ are other than hydrogen, they may form, together with the nitrogen atoms to which they are attached, 5- or 6-membered heterocyclic rings;

R'₆ is selected from C₁-C₁₈ alkylene groups, C₆-C₁₄ arylene groups, arylene groups optionally substituted with C₁-C₁₈ alkyl groups, C₇-C₃₀ alkylenearylene or arylenealkylene groups, C₃-C₃₀ cycloalkylene groups, said cycloalkylene groups optionally being substituted with C₁-C₁₈ alkyl groups; and

n is a integer from 0 to 5.

61. (New) The crosslinkable elastomeric composition according to claim 47, wherein the silane coupling agent is selected from vinylsilane compounds having the following formula (III):



wherein:

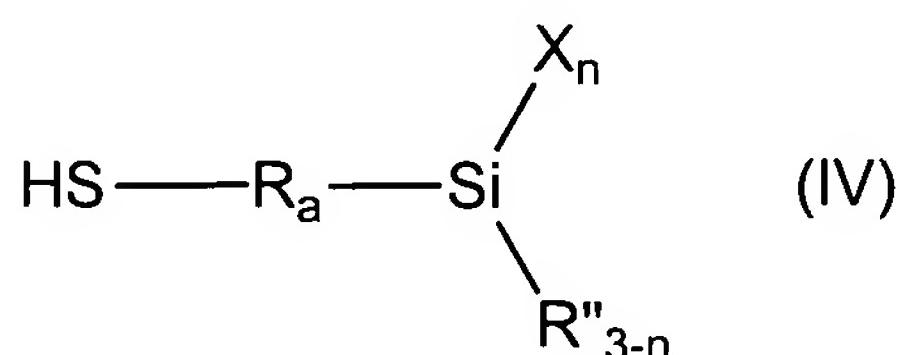
R represents an alkenyl group or an alkenyloxy group;

R' represents a hydrogen atom or an alkyl group;

Y represents a hydrolizable organic group; and

n is 0, 1 or 2.

62. (New) The crosslinkable elastomeric composition according to claim 47, wherein the silane coupling agent is selected from mercaptosilane compounds having the following formula (IV):



wherein:

X represents a halogen atom selected from chlorine, bromine, iodine, fluorine, or a C₁-C₈ alkoxy group;

R_a represents a C₁-C₁₀ alkylene group;

R" represents a C₁-C₃₀ alkyl group, a C₇-C₃₀ alkylaryl or arylalkyl group, a C₅-C₃₀ cycloaliphatic group, or a C₆-C₂₀ aromatic group; and

n is an integer from 1 to 3.

63. (New) The crosslinkable elastomeric composition according to claim 47, wherein the silane coupling agent is selected from epoxysilane compounds, 3-glycidyloxypropyltrimethoxy-silane, 3-glycidyloxypropylmethyldimethoxysilane, 2-(3,4-epoxycyclohexyl)ethyltrimethoxysilane, or mixture thereof.

64. (New) The crosslinkable elastomeric composition, according to claim 47, wherein the vulcanized rubber in a subdivided form is surface treated with an amount of at least one silane coupling agent of 0.1% by weight to 5% by weight, said amount

being expressed with respect to the total weight of the vulcanized rubber in a subdivided form plus the silane coupling agent.

65. (New) The crosslinkable elastomeric composition according to claim 64, wherein the vulcanized rubber in a subdivided form is surface treated with an amount of at least one silane coupling agent of 0.2% by weight to 3% by weight, said amount being expressed with respect to the total weight of the vulcanized rubber in a subdivided form plus the silane coupling agent.

66. (New) The crosslinkable composition according to claim 47, wherein the sulfur-based vulcanizing agent is selected from:

soluble sulfur (crystalline sulfur);
insoluble sulfur (polymeric sulfur);
sulfur dispersed in oil; or
sulfur donors, tetramethylthiuram disulfide, tetrabenzylthiuram disulfide, tetraethylthiuram disulfide, tetrabutylthiuram disulfide, dimethyldiphenylthiuram disulfide, pentamethylenethiuram tetrasulfide or hexasulfide, morpholinobenzothiazole disulfide, N-oxydiethylenedithiocarbamyl-N'-oxydiethylene-sulphenamide, dithiodimorpholine, or caprolactam disulfide.

67. (New) The crosslinkable composition according to claim 66, wherein said sulfur-based vulcanizing agent is present in an amount of 0.5 phr to 5 phr.

68. (New) The crosslinkable elastomeric composition according to claim 47, wherein at least one reinforcing filler is present in an amount of 0.1 phr to 120 phr.

69. (New) The crosslinkable elastomeric composition according to claim 68, wherein the reinforcing filler is carbon black.

70. (New) The crosslinkable elastomeric composition according to claim 68, wherein the reinforcing filler is silica.

71. (New) The crosslinkable elastomeric composition according to claim 70, wherein a silica coupling agent is present.

72. (New) The crosslinkable composition according to claim 70, wherein the vulcanized rubber in subdivided form is surface pre-treated with at least one silane coupling agent.

73. (New) A tire for a vehicle wheel, comprising at least one structural element obtained by crosslinking a crosslinkable elastomeric composition comprising:

at least one vulcanized rubber in a subdivided form surface treated with at least one silane coupling agent;

at least one diene elastomeric polymer; and

at least one sulfur-based vulcanizing agent.

74. (New) The tire for a vehicle wheel according to claim 73, comprising:

a carcass structure shaped in a substantially toroidal configuration, the opposite lateral edges of which are associated with respective right-hand and left-hand bead wires to form respective beads;

a belt structure applied in a radially external position with respect to said carcass structure;

a tread band radially superimposed on said belt structure;

a pair of sidewalls applied laterally on opposite sides with respect to said carcass structure;

said tread band comprising a structural element obtained by crosslinking a crosslinkable elastomeric composition comprising:

at least one vulcanized rubber in a subdivided form surface treated with at least one silane coupling agent;

at least one diene elastomeric polymer; and

at least one sulfur-based vulcanizing agent.

75. (New) The tire for a vehicle wheel according to claim 73, wherein the vulcanized rubber in a subdivided form has a particle size not higher than 5 mm.

76. (New) The tire for a vehicle wheel according to claim 73, wherein the vulcanized rubber in a subdivided form is present in an amount of 5 phr to 30 phr.

77. (New) The tire for a vehicle wheel according to claim 73, wherein the vulcanized rubber in a subdivided form comprises at least one crosslinked diene elastomeric polymer or copolymer selected from: cis-1,4-polyisoprene, 3,4-polyisoprene, polybutadiene, optionally halogenated isoprene/isobutene copolymers, 1,3-butadiene/acrylonitrile copolymers, styrene/1,3-butadiene copolymers, styrene/isoprene/1,3-butadiene copolymers, styrene/1,3-butadiene/acrylonitrile copolymers, or mixtures thereof.

78. (New) The tire for a vehicle wheel according to claim 73, wherein the vulcanized rubber in a subdivided form comprises at least one crosslinked elastomeric polymer of one or more monoolefins with an olefinic comonomer or derivatives thereof.

79. (New) The tire for a vehicle wheel according to claim 73, wherein the diene elastomeric polymer is selected from: cis-1,4-polyisoprene, 3,4-polyisoprene, polybutadiene, optionally halogenated isoprene/isobutene copolymers, 1,3-

butadiene/acrylonitrile copolymers, styrene/1,3-butadiene copolymers, styrene/isoprene/1,3-butadiene copolymers, styrene/1,3-butadiene/acrylonitrile copolymers, or mixtures thereof.

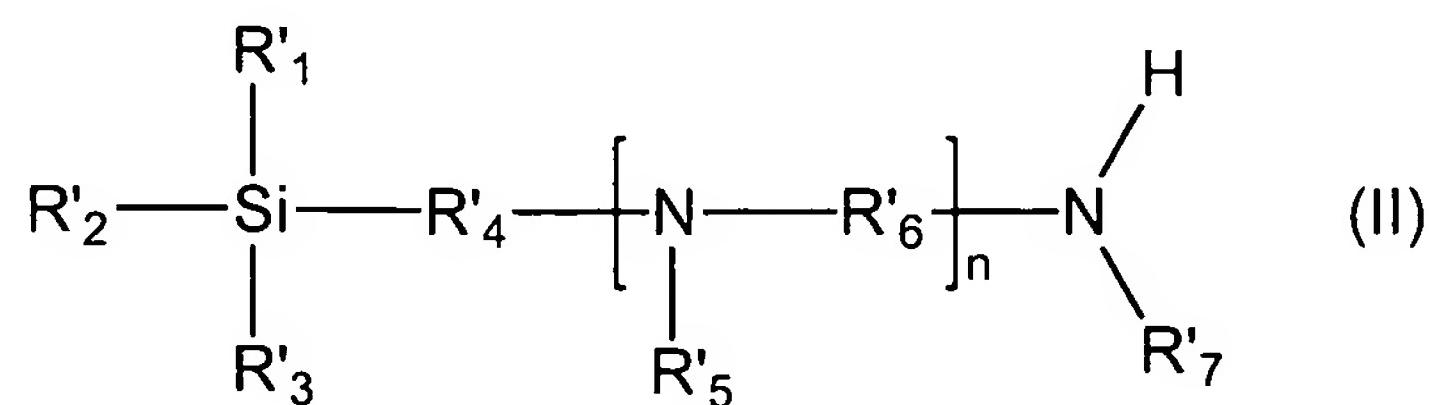
80. (New) The tire for a vehicle wheel according to claim 73, wherein the elastomeric composition comprises at least one elastomeric polymer of one or more monoolefins with an olefinic comonomer or derivatives thereof.

81. (New) The tire for a vehicle wheel according to claim 73, wherein the silane coupling agent is selected from sulfide silane compounds having the following formula (I):



wherein Z is selected from the following groups: $-\text{Si}(R_1)_2(R_2)$, $-\text{Si}(R_1)(R_2)_2$ and $-\text{Si}(R_2)_3$, in which R_1 is a C₁-C₄ alkyl group, a cyclohexyl group or a phenyl group and R_2 is a C₁-C₁₈ alkoxy group or a C₅-C₈ cycloalkoxy group; Alk is a divalent hydrocarbon containing from 1 to 18 carbon atoms and n is a number from 2 to 8.

82. (New) The tire for a vehicle wheel according to claim 73, wherein the silane coupling agent is selected from aminosilane compounds having the following formula (II):



wherein:

R'_1 , R'_2 and R'_3 , which may be identical or different, are selected from hydrogen, C₁-C₈ alkoxy groups, C₁-C₁₈ alkyl groups, C₆-C₂₀ aryl groups, C₇-C₃₀ alkylaryl or

arylalkyl groups, on condition that at least one of the groups R'₁, R'₂ and R'₃ represents an alkoxy group;

R'₄ is selected from C₁-C₈ alkylene groups, C₆-C₂₀ arylene groups, said arylene groups optionally being substituted with C₁-C₈ alkyl groups;

R'₅ and R'₇, which may be identical or different, are selected from hydrogen, C₁-C₁₈ alkyl groups; or, when R₅ and R₇ are other than hydrogen, they may form, together with the nitrogen atoms to which they are attached, 5- or 6-membered heterocyclic rings;

R'₆ is selected from C₁-C₁₈ alkylene groups, C₆-C₁₄ arylene groups, arylene groups optionally substituted with C₁-C₁₈ alkyl groups, C₇-C₃₀ alkylenearylene or arylenealkylene groups, C₃-C₃₀ cycloalkylene groups, said cycloalkylene groups optionally being substituted with C₁-C₁₈ alkyl groups; and

n is a integer from 0 to 5.

83. (New) The tire for a vehicle wheel according to claim 73, wherein the silane coupling agent is selected from vinylsilane compounds having the following formula (III):



wherein:

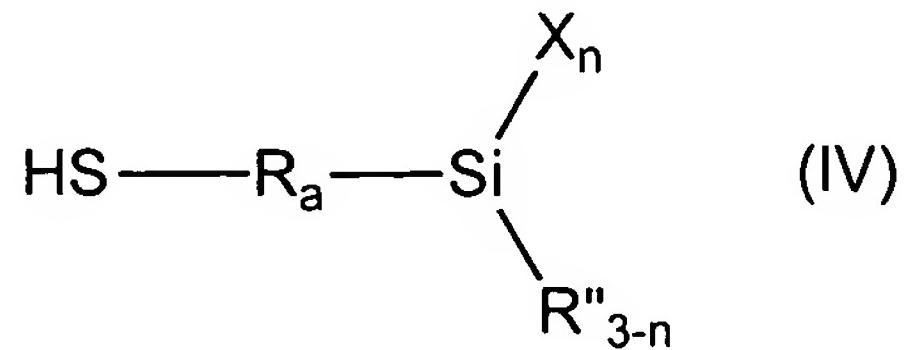
R represents an alkenyl group or an alkenyloxy group;

R' represents a hydrogen atom or an alkyl group;

Y represents a hydrolyzable organic group; and

n is 0, 1 or 2.

84. (New) The tire for a vehicle wheel according to claim 73, wherein the silane coupling agent is selected from mercaptosilane compounds having the following formula (IV):



wherein:

X represents a halogen atom selected from chlorine, bromine, iodine, fluorine, or a C₁-C₈ alkoxy group;

R_a represents a C₁-C₁₀ alkylene group;

R" represents a C₁-C₃₀ alkyl group, a C₇-C₃₀ alkylaryl or arylalkyl group, a C₅-C₃₀ cycloaliphatic group, or a C₆-C₂₀ aromatic group; and

n is an integer from 1 to 3.

85. (New) The tire for a vehicle wheel according to claim 73, wherein the silane coupling agent is selected from epoxysilane compounds, 3-glycidyloxypropyltrimethoxy-silane, 3-glycidyloxypropylmethyldimethoxysilane, 2-(3,4-epoxycyclohexyl)ethyltrimethoxysilane, or mixture thereof.

86. (New) The tire for a vehicle wheel according to claim 73, wherein the vulcanized rubber in a subdivided form is surface treated with an amount of at least one silane coupling agent of 0.1% by weight to 5% by weight, said amount being expressed with respect to the total weight of the vulcanized rubber in a subdivided form plus the silane coupling agent.

87. (New) The tire for a vehicle wheel according to claim 73, wherein the sulfur-based vulcanizing agent is selected from:

soluble sulfur (crystalline sulfur);
insoluble sulfur (polymeric sulfur);
sulfur dispersed in oil; or
sulfur donors, tetramethylthiuram disulfide, tetrabenzylthiuram disulfide, tetraethylthiuram disulfide, tetrabutylthiuram disulfide, dimethyldiphenylthiuram disulfide, pentamethylenethiuram tetrasulfide or hexasulfide, morpholinobenzothiazole disulfide, N-oxydiethylenedithiocarbamyl-N'-oxydiethylene-sulphenamide, dithiodimorpholine, or caprolactam disulfide.

88. (New) The tire for a vehicle wheel according to claim 73, wherein at least one reinforcing filler is present in an amount of 0.1 phr to 120 phr.

89. (New) A crosslinked manufactured product obtained by crosslinking a crosslinkable elastomeric composition as defined according to claim 47.

90. (New) A process for producing a crosslinkable elastomeric composition comprising the following steps:

- (a) surface treating at least one vulcanized rubber in a subdivided form with at least one silane coupling agent;
- (b) mixing the surface treated vulcanized rubber in a subdivided form obtained in step (a) with at least one diene elastomeric polymer; and
- (c) adding to the elastomeric composition obtained in step (b) at least one sulfur-based vulcanizing agent.

91. (New) The process according to claim 90, wherein step (a) is carried out at a temperature of 50°C to 150°C.

92. (New) The process according to claim 90, wherein step (a) is carried out for 5 min to 30 min.

93. (New) The process according to claim 90, wherein said vulcanized rubber in a subdivided form is heated at a temperature of 50°C to 150°C before the addition of the silane coupling agent.

94. (New) The process according to claim 90, wherein step (b) is carried out at a temperature of 100°C to 180°C.

95. (New) The process according to claim 90, wherein step (b) is carried out for 2 min to 30 min.

96. (New) The process according to claim 90, wherein step (c) is carried out at a temperature of 80°C to 120°C.

97. (New) The process according to claim 90, wherein step (c) is carried out for 2 min to 30 min.

98. (New) The process according to claim 90, wherein the vulcanized rubber in a subdivided form has a particle size not higher than 5 mm.

99. (New) The process according to claim 90, wherein the diene elastomeric polymer is selected from: cis-1,4-polyisoprene, 3,4-polyisoprene, polybutadiene, optionally halogenated isoprene/isobutene copolymers, 1,3-butadiene/acrylonitrile copolymers, styrene/1,3-butadiene copolymers, styrene/isoprene/1,3-butadiene copolymers, styrene/1,3-butadiene/acrylonitrile copolymers, or mixtures thereof.

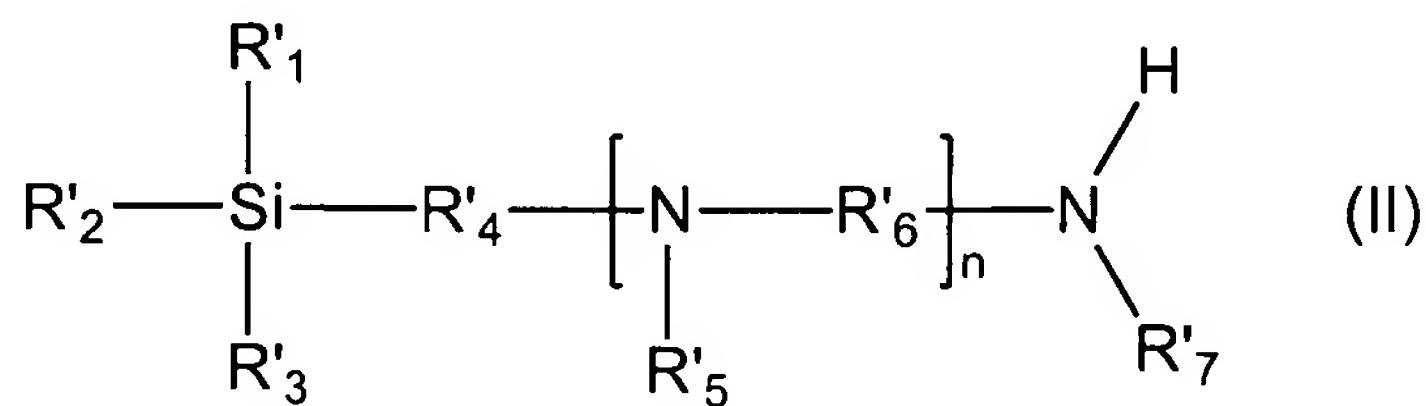
100. (New) The process according to claim 90, wherein the elastomeric composition comprises at least one elastomeric polymer of one or more monoolefins with an olefinic comonomer or derivatives thereof.

101. (New) The process according to claim 90, wherein the silane coupling agent is selected from sulfide silane compounds having the following formula (I):



wherein Z is selected from the following groups: $-\text{Si}(\text{R}_1)_2(\text{R}_2)$, $-\text{Si}(\text{R}_1)(\text{R}_2)_2$ and $-\text{Si}(\text{R}_2)_3$, in which R_1 is a $\text{C}_1\text{-C}_4$ alkyl group, a cyclohexyl group or a phenyl group and R_2 is a $\text{C}_1\text{-C}_{18}$ alkoxy group or a $\text{C}_5\text{-C}_8$ cycloalkoxy group; Alk is a divalent hydrocarbon containing from 1 to 18 carbon atoms and n is a number from 2 to 8.

102. (New) The process according to claim 90, wherein the silane coupling agent is selected from aminosilane compounds having the following formula (II):



wherein:

R'_1 , R'_2 and R'_3 , which may be identical or different, are selected from hydrogen, $\text{C}_1\text{-C}_8$ alkoxy groups, $\text{C}_1\text{-C}_{18}$ alkyl groups, $\text{C}_6\text{-C}_{20}$ aryl groups, $\text{C}_7\text{-C}_{30}$ alkylaryl or arylalkyl groups, on condition that at least one of the groups R'_1 , R'_2 and R'_3 represents an alkoxy group;

R'_4 is selected from $\text{C}_1\text{-C}_8$ alkylene groups, $\text{C}_6\text{-C}_{20}$ arylene groups, said arylene groups optionally being substituted with $\text{C}_1\text{-C}_8$ alkyl groups;

R'₅ and R'₇, which may be identical or different, are selected from hydrogen, C₁-C₁₈ alkyl groups; or, when R₅ and R₇ are other than hydrogen, they may form, together with the nitrogen atoms to which they are attached, 5- or 6-membered heterocyclic rings;

R'₆ is selected from C₁-C₁₈ alkylene groups, C₆-C₁₄ arylene groups, arylene groups optionally substituted with C₁-C₁₈ alkyl groups, C₇-C₃₀ alkylenearylene or arylenealkylene groups, C₃-C₃₀ cycloalkylene groups, said cycloalkylene groups optionally being substituted with C₁-C₁₈ alkyl groups; and

n is a integer from 0 to 5.

103. (New) The process according to claim 90, wherein the silane coupling agent is selected from vinylsilane compounds having the following formula (III):



wherein:

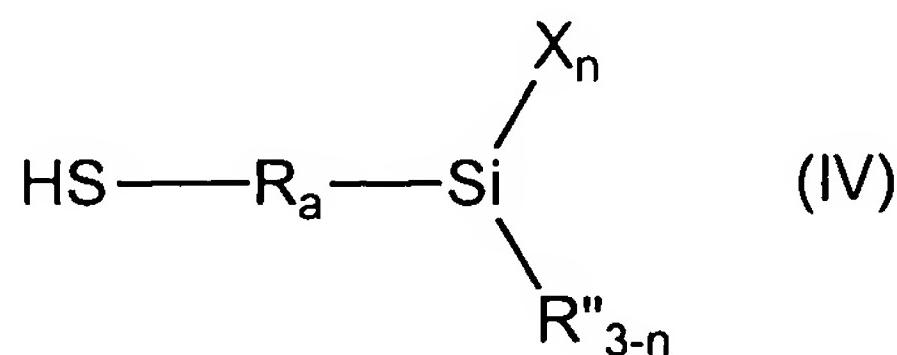
R represents an alkenyl group or an alkenyloxy group;

R' represents a hydrogen atom or an alkyl group;

Y represents a hydrolyzable organic group; and

n is 0, 1 or 2.

104. (New) The process according to claim 90, wherein the silane coupling agent is selected from mercaptosilane compounds having the following formula (IV):



wherein:

X represents a halogen atom selected from chlorine, bromine, iodine, fluorine, or a C₁-C₈ alkoxy group;

R_a represents a C₁-C₁₀ alkylene group;

R" represents a C₁-C₃₀ alkyl group, a C₇-C₃₀ alkylaryl or arylalkyl group, a C₅-C₃₀ cycloaliphatic group, a C₆-C₂₀ aromatic group; and

n is an integer from 1 to 3.

105. (New) The process according to claim 90, wherein the silane coupling agent is selected from epoxysilane compounds, 3-glycidyloxypropyltrimethoxy-silane, 3-glycidyloxypropylmethyldimethoxysilane, 2-(3,4 epoxycyclohexyl)ethyltrimethoxysilane, or mixture thereof.

106. (New) The process according to claim 90, wherein the vulcanized rubber in a subdivided form is surface treated with an amount of at least one silane coupling agent of 0.1% by weight to 5% by weight, said amount being expressed with respect to the total weight of the vulcanized rubber in a subdivided form plus the silane coupling agent.

107. (New) The process according to claim 90, wherein the sulfur-based vulcanizing agent is selected from:

soluble sulfur (crystalline sulfur);

insoluble sulfur (polymeric sulfur);

sulfur dispersed in oil; or

sulfur donors, tetramethylthiuram disulfide, tetrabenzylthiuram disulfide, tetraethylthiuram disulfide, tetrabutylthiuram disulfide, dimethyldiphenylthiuram disulfide, pentamethylenethiuram tetrasulfide or hexasulfide, morpholinobenzothiazole disulfide,

PATENT
Customer No. 22,852
Attorney Docket No. 07040.0264

N-oxydiethylenedithiocarbamyl-N'-oxydiethylene-sulphenamide, dithiodimorpholine, or caprolactam disulfide.